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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/085,387	02/28/2002	Anthony D. Kurtz	Kulite-71	6637
28581	7590	02/25/2004	EXAMINER	
DUANE MORRIS LLP 100 COLLEGE ROAD WEST, SUITE 100 PRINCETON, NJ 08540-6604			YUAN, DAH WEI D	
			ART UNIT	PAPER NUMBER
			1745	

DATE MAILED: 02/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/085,387

Applicant(s)

KURTZ, ANTHONY D.

Examiner

Dah-Wei D. Yuan

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 January 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 3-13 and 15-20 is/are allowed.
- 6) ☒ Claim(s) 1, 2 and 14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

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**SOLID STATE FUEL CELL MADE FROM POROUS AND PARTIALLY POROUS
SEMICONDUCTOR STRUCTURES**

Examiner: Yuan

S.N. 10/085,387

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February 16, 2004

Detailed Action

1. The Applicant's amendment filed on January 16, 2004 was received. The title of the invention was changed. Claims 3,4 were amended.
2. The text of those sections of Title 35, U.S.C. code not included in this action can be found in the prior Office Action issued on October 14, 2003.

Claim Objections

3. The claim objections on claim 4 are withdrawn, because claim 4 has been amended.

Claim Rejections - 35 USC § 103

4. The claim rejections under 35 U.S.C.103(a) as being unpatentable over Kawatsu (US 5,885,727) and Mallari et al. (US 2003/0044674 A1) on claims 1,2,14 are maintained. The rejection is repeated below for convenience.

With respect to claim 1, Kawatsu teaches a fuel cell system comprising an electrolyte (11), an anode (12) and a cathode (13) functioning as gas diffusion electrode and arranged across the electrolyte to form a sandwich structure. Separators (14,15) are arranged across the sandwich structure and respectively connecting with the anode and the cathode to define flow paths of fuel

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and oxidant. The planar electrolyte is composed of a silicon carbide matrix (a semiconductor structure) impregnated with electrolytic solution. See Figure 1; Column 11, Lines 50-67.

However, Kawatsu does not teach the use of semiconductor anode and cathode structures in the fuel cell system. Mallari et al. teach the use of electrode structure comprising a silicon (semiconductor) substrate with one or more discrete porous, bulk matrix regions. Metallic catalyst carried on the silicon electrode structures is also disclosed wherein the catalyst facilitates oxidation-reduction reactions of a fuel or an oxidant. The catalyst may be carried on the surface or face of a silicon substrate. The use of silicon electrode structure, when appropriately doped, can function as a current collector and provide the ability to be selectively sculpted, metallized and processed into complicated structure via semiconductor micro-fabrication techniques. See Paragraphs 15, 28, 38. Therefore, it would have been obvious to one of ordinary skill in the art to use the semiconductor anode and cathode structures on the planar electrolyte structure of Kawatsu, because Mallari et al. teach the use of silicon electrode structure to enhance the performance of the resultant fuel cell system.

With respect to claim 2, Mallari et al. teach the electrode structure is surrounded by a non-porous peripheral structure of silicon as shown in Figures 38A, 38 B, 65A and 65B. It would have been obvious to one of ordinary skill in the art to use the semiconductor anode and cathode structures with a non-porous peripheral structure on the planar electrolyte structure of Kawatsu, because Mallari et al. teach the use of silicon electrode structure to enhance the performance of the resultant fuel cell system.

With respect to claim 14, Mallari et al. teach the porous silicon substrates is formed by a photoelectrochemical HF anodic etching technique wherein the pores would be invariably different in sizes. It would have been obvious to one of ordinary skill in the art to use the semiconductor anode and cathode structures with different pore diameters on the planar electrolyte structure of Kawatsu, because Mallari et al. teach the use of silicon electrode structure to enhance the performance of the resultant fuel cell system.

Allowable Subject Matter

5. Claims 3-13,15-20 are allowed. The following is a statement of reasons for the indication of allowable subject matter: The invention of independent claim 3 recites a solid state fuel cell comprising a planar semiconductor anode structure having a plurality of pores, a planar semiconductor cathode structure having a plurality of pores, and an electrolyte planer semiconductor structure having a plurality of pores, wherein said electrolyte structure is fabricated from silicon. The closest prior art of record, Kawatsu and Mallari et al., do not teach or suggest the electrolyte structure is fabricated from silicon. The invention of independent claim 4 recites a solid state fuel cell, comprising a planar semiconductor anode structure having a plurality of pores, a planar semiconductor cathode structure having a plurality of pores, and an electrolyte planer semiconductor structure having a plurality of pores, wherein said pores of said anode and cathode have an enlarged opening portion at said first surface tapering to a smaller opening at said second surface. The closest prior art of record, Kawatsu and Mallari et al., only teach the openings of even size at both surfaces of the electrodes.

Response to Arguments

6. Applicant's arguments filed on January 16, 2004 have been fully considered but they are not persuasive.

Applicant's principle arguments are

Kawatsu reference does not disclose an electrolyte structure having a plurality of pores directed from a first surface to a second surface as required by claim 1.

In response to Applicant's arguments, please consider the following comments.

Kawatsu teaches the electrolyte (11) is composed of a silicon carbide matrix impregnated with concentrated liquid phosphoric acid. See Column 11, Lines 64-65. It is essential that electrolyte connects the anode structure and cathode structure in a fuel cell to facilitate the transport of ionic species. Therefore, the porous silicon carbide material of Kawatsu must have through-thickness pores such that the electrolytic solution (phosphoric acid) can bridge the anode and the cathode in a fuel cell.

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after

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the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dah-Wei D. Yuan whose telephone number is (571) 272-1295. The examiner can normally be reached on Monday-Friday (8:00-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan, can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Dah-Wei D. Yuan
February 16, 2004

